How Does Acetabular Component Orientation Change from Supine to Standing in Patients with Total Hip Arthroplasty?

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Introduction: The importance of acetabular component position in total hip arthroplasty (THA) is widely recognized. Although rotational movement of the pelvis occurs, conventional imaging techniques are performed in a supine position. The "optimal" window for position was defined based on supine imaging. The purpose of this study was to quantify the difference between standing and supine acetabular component orientation.

Methods: One hundred and thirteen hips that had undergone THA with postoperative supine and standing images were identified. Supine images were obtained with conventional radiography. Standing images were obtained utilizing a low radiation, three dimensional x-ray orthopaedic imaging system. Digital edge detection software was used to obtain component orientation. "Functional" inclination was measured on the standing coronal image using a horizontal line as a reference. Sagittal images established ante- or retro-version.

Results: There were statistically significant differences in supine "anatomic" versus standing "functional" inclination as well as supine versus standing version ($p<0.0001$). The mean change, by absolute value, of inclination and version from supine to standing was 4.6° (0.01° - 16.2°) and 5.9° (0 - 17.2), respectively. With respect to inclination, 49 (43%) hips had a change $> 5°$, and 7 (6%) hips had a change $> 10°$. With respect to version, 69 (53%) hip has a change $> 5°$, and 17 (15%) hips had a change $> 10°$.

Conclusion: This is the largest study quantifying the difference in functional standing and anatomic supine acetabular component orientation in patients with THA using this imaging technique. Acetabular component orientation changes from the supine to the standing position. The amount of change is substantial in both position parameters, particularly version ($> 5°$ in more than 50% cases and $> 10°$ in 15% cases). Functional position needs to be considered when defining an "ideal" window for acetabular component position in THA.